Syntocinon®

Posterior pituitary lobe hormones

DESCRIPTION AND COMPOSITION

Pharmaceutical forms

Concentrate for solution for infusion; Solution for injection (in 1 mL ampoule) containing 5 IU/mL.

Concentrate for solution for infusion; Solution for injection (in 1 mL ampoule) containing 10 IU/mL.

Active substance

The active substance is synthetic oxytocin. Each ampoule contains 1mL solution. Certain dosage strengths and dosage forms may not be available in all countries.

EXCIPIENTS

Sodium acetate trihydrate, acetic acid glacial, chlorobutanol, ethanol 94% w/w, water for injections.

Pharmaceutical formulations may vary between countries.

INDICATIONS

Antepartum

- Induction of labor for medical reasons, e.g. in cases of post-term gestation, premature rupture of the membranes, pregnancy-induced hypertension associated with significant protein in the urine (pre-eclampsia).
- Enhancement of labor in selected cases of uterine inertia.
- Syntocinon may also be indicated in early stage of pregnancy, as adjunctive therapy for management of incomplete, inevitable or missed abortion.

Postpartum

- During cesarean section, but after the delivery of the child.
- Prevention and treatment of postpartum hemorrhage associated with uterine atony.

DOSAGE AND ADMINISTRATION

Dosage

General target population

Induction or enhancement of labor

Syntocinon should be administered as an intravenous (i.v.) drip infusion or, preferably, by means of a variable-speed infusion pump. For drip infusion it is recommended that 10 IU of Syntocinon be added to 1000 mL of a physiological electrolyte solution (such as sodium chloride 0.9%). For patients in whom infusion of sodium chloride must be avoided, 5% dextrose solution may be used as the diluent (see section WARNINGS AND PRECAUTIONS). To ensure even mixing, the bottle or bag must be turned upside down several times before use.

The initial infusion rate should be set at 1 to 2 milliunits/minute (2 to 4 drops/minute). It may be increased gradually at intervals not shorter than 20 minutes and increments of not more than 1 to 2 milliunits/minute until a contraction pattern similar to that of normal labour is established. In pregnancy near term, this can often be achieved with an infusion of less than 10 milliunits/minute (20 drops/minute), and the recommended maximum rate is 20 milliunits/minute (40 drops/minute). In the unusual event of higher rates being required, as may occur in the management of fetal death in utero or for induction of labor at an earlier stage of pregnancy when the uterus is less sensitive to oxytocin, it is advisable to use a more concentrated Syntocinon solution, e.g. 10 IU in 500 mL.

When using a motor-driven infusion pump which delivers smaller volumes than those given by drip infusion, the concentration suitable for infusion within the recommended dosage range must be calculated according to the specifications of the pump.

The frequency, strength and duration of contractions and also the fetal heart rate must be carefully monitored throughout the infusion. Once an adequate level of uterine activity is attained, the infusion rate can often be reduced. In the event of uterine hyperactivity and/or foetal distress, the infusion must be discontinued immediately.

If, in women who are at term or near term, regular contractions are not established after the infusion of a total amount of 5 IU, it is recommended that the attempt to induce labor should be terminated; it may be repeated on the following day, starting again from a rate of 1 to 2 milliunits/minute.

Cesarean section

5 IU by i.v. infusion (5 IU diluted in physiological electrolyte solution and administered as an i.v. drip infusion or, preferably, by means of a variable-speed infusion pump over 5 minutes) immediately after delivery.

Prevention of postpartum uterine hemorrhage

The usual dose is 5 IU by i.v. infusion (5 IU diluted in physiological electrolyte solution and administered as an i.v. drip infusion or, preferably, by means of a variable-speed infusion pump over 5 minutes), or 5 to 10 IU i.m. after delivery of the placenta. In women given Syntocinon for induction or enhancement of labor, the infusion should be continued at an increased rate during the third stage of labor and for the next few hours thereafter.

Treatment of postpartum uterine hemorrhage

5 IU by i.v. infusion (5 IU diluted in physiological electrolyte solution and administered as an i.v. drip infusion or, preferably, by means of a variable-speed infusion pump over 5 minutes), or 5 to 10 IU i.m., followed in severe cases by i.v. infusion of a solution containing 5 to 10 IU of oxytocin in 500 mL of an electrolyte-containing diluent, run at the rate necessary to control uterine atony.

Incomplete, inevitable, or missed abortion

5 IU by i.v. infusion (5 IU diluted in physiological electrolyte solution and administered as an i.v. drip infusion or, preferably, by means of a variable-speed infusion pump over 5 minutes) or 5 to 10 IU i.m., if necessary followed by i.v. infusion at a rate of 20 to 40 milliunits/min.

Special populations

Renal impairment

No studies have been performed in renally impaired patients.

Hepatic impairment

No studies have been performed in hepatically impaired patients.

Pediatric patients

No studies have been performed in pediatric patients.

Geriatric patients

No studies have been performed in elderly patients (65 years old and over).

CONTRAINDICATIONS

- Known hypersensitivity to oxytocin or to any of the excipients of Syntocinon.
- Hypertonic uterine contractions, fetal distress when delivery is not imminent.

Any condition in which, for fetal or maternal reasons, spontaneous labor is unadvisable and/or vaginal delivery is contraindicated, e.g.:

Significant cephalopelvic disproportion.

- Fetal malpresentation.
- Placenta previa and vasa previa.
- Placental abruption.
- Cord presentation or prolapse.
- Overdistension or impaired resistance of the uterus to rupture as in multiple pregnancy.
- Polyhydramnios.
- Grand multiparity.
- Presence of a uterine scar resulting from major surgery, including classical cesarean section.

Syntocinon must not be administered within 6 hours after vaginal prostaglandins have been given (see section INTERACTIONS).

Syntocinon should not be used for prolonged periods in patients with oxytocin-resistant uterine inertia, severe preeclamptic toxaemia, or severe cardiovascular disorders.

WARNINGS AND PRECAUTIONS

Induction of labor

The induction of labor by means of oxytocin should be attempted only when strictly indicated for medical reasons rather than for convenience. Administration should only be under hospital conditions and qualified medical supervision. Syntocinon should not be given as i.v. bolus injection as it may cause an acute short-lasting hypotension accompanied with flushing and reflex tachycardia.

Cardiovascular disorders

Syntocinon should be used with caution in patients who have a pre-disposition to myocardial ischemia due to pre-existing cardiovascular disease (such as hypertrophic cardiomyopathy, valvular heart disease and/or ischemic heart disease including coronary artery vasospasm), to avoid significant changes in blood pressure and heart rate in these patients.

QT syndrome

Syntocinon should be given with caution to patients with known long QT syndrome or related symptoms and to patients taking drugs that are known to prolong the QTc interval (see section INTERACTIONS).

When Syntocinon is given for induction and enhancement of labor:

- It must only be administered as an i.v. infusion, and never by s.c., i.m. or i.v. bolus injection.
- **Fetal distress and fetal death:** Administration of oxytocin at excessive doses results in uterine overstimulation which may cause foetal distress, asphyxia and death, or may lead to hypertonicity, tetanic contractions or rupture of the uterus. Careful monitoring of fetal heart rate and uterine motility (frequency, strength, and duration of contractions) is essential, so that the dosage may be adjusted to individual response.
- Particular caution is required in the presence of borderline cephalopelvic disproportion, secondary uterine inertia, mild or moderate degrees of pregnancy-induced hypertension or cardiac disease and in patients above 35 years of age or with a history of lower-uterine- segment caesarean section.
- **Disseminated intravascular coagulation:** In rare circumstances, the pharmacological induction of labor using uterotonic agents, including oxytocin, increases the risk of postpartum disseminated intravascular coagulation (DIC). The pharmacological induction itself and not a particular agent is linked to such risk. This risk is increased in particular if the woman has additional risk factors for DIC such as being 35 years of age or over, complications during the pregnancy and gestational age more than 40 weeks. In these women, oxytocin or any other alternative drug should be used with care, and the practitioner should be alerted by signs of DIC.

Intrauterine death

In the case of fetal death in utero, and/or in the presence of meconium-stained amniotic fluid, tumultuous labor must be avoided, as it may cause amniotic fluid embolism.

Water intoxication

Because oxytocin possesses slight antidiuretic activity, its prolonged i.v. administration at high doses in conjunction with large volumes of fluid, as may be the case in the treatment of inevitable or missed abortion, or in the management of postpartum hemorrhage, may cause water intoxication associated with hyponatremia. The combined antidiuretic effect of oxytocin and the i.v. fluid administration may cause fluid overload leading to a hemodynamic form of acute pulmonary edema without hyponatremia. To avoid these rare complications, the following precautions must be observed whenever high doses of oxytocin are administered over a long time: an electrolyte-containing diluent must be used (not dextrose); the volume of infused fluid should be kept low (by infusing oxytocin at a higher concentration than recommended for the induction or enhancement of labor at term); fluid intake by mouth must be restricted; a fluid balance chart should be kept; and serum electrolytes should be measured when electrolyte imbalance is suspected.

Renal Impairment

Caution should be exercised in patients with severe renal impairment because of possible water retention and possible accumulation of oxytocin (see section CLINICAL PHARMACOLOGY).

INTERACTIONS

Interaction resulting in a concomitant use not recommended.

Prostaglandins and their analogues

Prostaglandins and its analogues facilitate contraction of the myometrium. Hence oxytocin can potentiate the uterine action of prostaglandins and analogues, and vice versa (see section CONTRAINDICATIONS).

Drugs prolonging the QT interval

Oxytocin should be considered as potentially arrhythmogenic, particularly in patients with other risk factors for torsades de pointes such as drugs which prolong the QT interval or in patients with a history of long QT syndrome (see section WARNINGS AND PRECAUTIONS).

Interactions to be considered

Inhalation anesthetics

Inhalation anesthetics (e.g. cyclopropane, halothane, sevoflurane, desflurane) have a relaxing effect on the uterus and produce a notable inhibition of uterine tone and thereby, may diminish the uterotonic effect of oxytocin. Their concurrent use with oxytocin has also been reported to cause cardiac rhythm disturbances.

Vasoconstrictors/sympathomimetics

Oxytocin may enhance the vasopressor effects of vasoconstrictors and sympathomimetics, even those contained in local anesthetics.

Caudal anesthetics

When given during or after caudal block anaesthesia, oxytocin may potentiate the pressor effect of sympathomimetic vasoconstrictor agents.

WOMEN OF CHILD-BEARING POTENTIAL, PREGNANCY, BREAST-FEEDING, AND FERTILITY

Women of childbearing potential

Not applicable for Syntocinon because of the targeted indications.

Pregnancy

Pre-clinical data for oxytocin reveal no special hazard based on conventional studies of single dose acute toxicity, genotoxicity, and mutagenicity. No standard teratogenicity and reproductive performance studies with oxytocin are available (see section NON CLINICAL SAFETY DATA). Based on the wide

experience with this drug and its chemical structure and pharmacological properties, it is not expected to present a risk of fetal abnormalities when used as indicated.

Breast-feeding

Oxytocin may be found in small quantities in mother's breast milk. However, oxytocin is not expected to cause harmful effects in the newborn because it passes into the alimentary tract where it undergoes rapid inactivation.

Fertility

There are no studies on the potential effect of oxytocin on fertility.

EFFECTS ON ABILITY TO DRIVE AND USE MACHINES

No studies on the effects on the ability to drive and use machines have been performed. Women with uterine contractions should not drive or use machines.

ADVERSE DRUG REACTIONS

When oxytocin is used by i.v. infusion for the induction or enhancement of labor, its administration at excessive doses results in uterine overstimulation which may cause fetal distress, asphyxia and death, or may lead to hypertonicity, tetanic contractions or rupture of the uterus. Rapid i.v. bolus injection of oxytocin at doses amounting to several IU may result in acute short-lasting hypotension accompanied by flushing and reflex tachycardia. (see section WARNINGS AND PRECAUTIONS). These rapid hemodynamic changes may result in myocardial ischemia, particularly in patients with pre-existing cardiovascular disease. Rapid i.v. bolus injection of oxytocin at doses amounting to several IU may also lead to QTc prolongation. In rare circumstances (i.e. incidence rate <0.0006), the pharmacological induction of labor using uterotonic agents including oxytocin increases the risk of postpartum DIC (see section WARNINGS AND PRECAUTIONS).

Water intoxication

Water intoxication associated with maternal and neonatal hyponatremia has been reported in cases where high doses of oxytocin have been administered together with large amounts of electrolyte-free fluid over a prolonged period of time (see section WARNINGS AND PRECAUTIONS).

The combined antidiuretic effect of oxytocin and the i.v. fluid administration may cause fluid overload leading to a hemodynamic form of acute pulmonary oedema without hyponatremia (see section WARNINGS AND PRECAUTIONS).

The following adverse drug reactions (ADRs) have been reported regardless of the mode of administration:

ADRs (Table 1, Table 2) are ranked under heading of frequency, the most frequent first, using the following convention: very common (≥1/10); common (≥1/100, <1/10); uncommon (≥ 1/1,000, <1/100); rare (≥1/10,000, <1/1,000) very rare (<1/10,000), including isolated reports. The ADRs tabulated below are based on clinical trial results as well as postmarketing reports.

The ADRs derived from post-marketing experience with Syntocinon are via spontaneous case reports and literature cases. Because these reactions are reported voluntarily from a population of uncertain size, it is not possible to reliably estimate their frequency which is therefore categorized as not known. ADRs are listed according to system organ classes in MedDRA. Within each system organ class, ADRs are presented in order of decreasing seriousness.

Table 1 Adverse drug reactions in mother

System organ class	Adverse drug reaction
Immune system disorders	
Rare:	Anaphylactic/Anaphylactoid reaction associated with dyspnea, and hypotension; Anaphylactic/ Anaphylactoid shock
Nervous system disorders	
Common:	Headache
Cardiac disorders	
Common:	Tachycardia, bradycardia
Uncommon:	Arrhythmia
Not known:	Myocardial ischemia, Electrocardiogram QTc prolongation
Vascular disorders	
Not known:	Hypotension
Gastrointestinal disorders	
Common:	Nausea, vomiting
Skin and subcutaneous tissue disorders	
Rare:	Rash
Pregnancy, puerperium and perinatal conditions	
Not known:	Uterine hypertonus, tetanic contractions of uterus,uterine rupture.
Metabolism and nutrition disorders	
Not known:	Water intoxication, Hyponatraemia
Respiratory, thoracic and mediastinal disorders	
Not known:	Acute pulmonary oedema
General disorders and administration site conditions	
Not known:	Flushing
Blood and lymphatic system disorders	
Not known:	Disseminated intravascular coagulation
Skin and subcutaneous tissue disorders	
Not Known:	Angioedema

Table 2 Adverse drug reactions in fetus/neonate

System organ class	Adverse drug reaction
Pregnancy, puerperium and perinatal conditions	
Not known:	foetal distress syndrome, asphyxia and death
Metabolism and nutrition disorders	
Not known:	Neonatal hyponatraemia

OVERDOSAGE

The symptoms and consequences of overdose are those mentioned under sections WARNINGS AND PRECAUTIONS and ADVERSE DRUG REACTIONS. In addition, placental abruption and/or amniotic fluid embolism as a result of uterine overstimulation have been reported.

Treatment

When signs or symptoms of overdose occur during continuous i.v. administration of Syntocinon, the infusion must be discontinued at once and oxygen should be given to the mother. In the event of water intoxication, it is essential to restrict fluid intake, promote diuresis, correct electrolyte imbalance, and control possible convulsions.

CLINICAL PHARMACOLOGY

Mechanism of action (MOA) and pharmacodynamics

Oxytocin is a cyclic nonapeptide that is obtained by chemical synthesis. This synthetic form is identical to the natural hormone that is stored in the posterior pituitary and released into the systemic circulation in response to suckling and labor. Oxytocin stimulates the smooth muscle of the uterus, more powerfully towards the end of pregnancy, during labor, and immediately postpartum. At these times, the oxytocin receptors in the myometrium are increased. The oxytocin receptors are G-proteins coupled receptors. Activation of receptor by oxytocin triggers release of calcium from intracellular stores and thus leads to myometrial contraction. Oxytocin elicits rhythmic contractions in upper segment of uterus, similar in frequency, force and duration to those observed during labor. Being synthetic, oxytocin in Syntocinon does not contain vasopressin, but even in its pure form oxytocin possesses some weak intrinsic vasopressinlike antidiuretic activity.

Based on *in-vitro* studies, prolonged exposure of oxytocin had been reported to cause desensitization of oxytocin receptors probably due to down-regulation of oxytocin-binding sites, destabilization of oxytocin receptors mRNA and internalization of oxytocin receptors.

Plasma levels and onset/duration of effect

Intravenous infusion

When Syntocinon is given by continuous i.v. infusion at doses appropriate for induction or enhancement of labor, the uterine response sets in gradually and usually reaches a steady state within 20 to 40 minutes. The corresponding plasma levels of oxytocin are comparable to those measured during spontaneous first-stage labor. Upon discontinuation of the infusion, or following a substantial reduction in the infusion rate, e.g. in the event of overstimulation, uterine activity declines rapidly but may continue at an adequate lower level.

Intravenous injection and intramuscular injection

When administered by i.v. or i.m. injection for prevention or treatment of postpartum hemorrhage, Syntocinon acts rapidly with a latency period of less than 1 minute by i.v. injection, and of 2 to 4 minutes by i.m. injection. The oxytocic response lasts for 30 to 60 minutes after i.m. administration, possibly less after i.v. injection.

Pharmacokinetics

Absorption

Oxytocin is rapidly absorbed from the i.m. site. Plasma levels of oxytocin following i.v. infusion at 4 milliunits per minute in pregnant women at term were 2 to 5 microunits/mL.

Distribution

The steady-state distribution volume determined in 6 healthy men after intravenous injection was 12.2 L or 0.17 L/kg. Plasma protein binding is very low. It crosses the placenta in both directions. Oxytocin may be found in small quantities in mother's breast milk.

Biotransformation/metabolism

Oxytocinase is a glycoprotein aminopeptidase that is produced during pregnancy and appears in the plasma. It is capable of degrading oxytocin. It is produced from both the mother and the fetus. Liver and kidney plays a major role in metabolizing and clearing oxytocin from the plasma. Thus, liver, kidney and systemic circulation contribute to the biotransformation of oxytocin.

Elimination

Plasma half life of oxytocin ranges from 3 to 20 min. The metabolites are excreted in urine whereas less than 1% of the oxytocin is excreted unchanged in urine. The metabolic clearance rate amounts to 20 mL/kg/ min in the pregnant woman.

Renal impairment

No studies have been performed in renally impaired patients. However, considering the excretion of oxytocin and its reduced urinary excretion because of anti-diuretic properties, the possible accumulation of oxytocin can result in prolonged action (see section WARNINGS AND PRECAUTIONS).

Hepatic impairment

No studies have been performed in hepatically impaired patients. Pharmacokinetic alteration in patients with impaired hepatic function is unlikely since metabolizing enzyme, oxytocinase, is not confined to liver alone and the oxytocinase levels in placenta during the term has significantly increased. Therefore, biotransformation of oxytocin in impaired hepatic function may not result in substantial changes in metabolic clearance of oxytocin (see section WARNINGS AND PRECAUTIONS).

CLINICAL STUDIES

Syntocinon is an established product. No recent clinical studies are available.

NON-CLINICAL SAFETY DATA

Pre-clinical data for oxytocin reveal no special hazard for humans based on conventional studies of single-dose acute toxicity, genotoxicity, and mutagenicity.

Mutagenicity

An *in-vitro* genotoxicity and mutagenicity study with oxytocin has been reported. Tests were negative for chromosomal aberration and sister chromatid exchange in human peripheral lymphocyte cultures. No significant changes in the mitotic index were noticed. Oxytocin had no genotoxic properties. The genotoxic potential of oxytocin has not been determined *in vivo*.

Carcinogenicity, teratogenicity, and reproductive toxicity

Treatment of rats with oxytocin in early pregnancy at doses considered sufficiently in excess of the maximum recommended human dose caused embryonic loss in one study. No standard teratogenicity, reproductive performance and carcinogenicity studies with oxytocin are available.

INCOMPATIBILITIES

In the absence of compatibility studies, Syntocinon must not be mixed with other medicinal products.

Synthocinon should not be infused via the same apparatus as blood or plasma, because the peptide linkages are rapidly inactivated by oxytocin-inactivating enzymes. Synthocinon is incompatible with solutions containing sodium metasulphite as a stabiliser.

STORAGE

Syntocinon Concentrate for solution for infusion; Solution for injection: store in a refrigerator (2-8°C).

See folding box.

Syntocinon should not be used after the date marked "EXP" on the pack. Syntocinon should be kept out of the reach and sight of children.

SPECIAL PRECAUTIONS FOR DISPOSAL

Any unused product or waste material should be disposed of in accordance with local requirements.

Manufacturer:

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Package Leaflet

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Mylan